

The light and temperature regimes provided for these cultures are given in Table 1. The results obtained indicate that *Phacelia sericea* subsp. *sericea* and *P. idahoensis* are neither day neutral nor "nominal" long-day plants. The positive flowering responses obtained in all cultures given the combination of cool temperatures and short photoperiods would suggest that these are obligate short-day species; although the possibility of their being conditioned for flowering by low temperatures, independent of day length, remains very strong.

In a final experiment, seven plants of *Phacelia idahoensis* that had been held to long photoperiods of from 14 to 16 hours for 264 days were placed in an open cold frame and exposed to the late fall light and temperature regime of central Michigan. These conditions included temperatures ranging from +10° to -10°C. After 37 days of "outside" weather, these plants, the pots frozen solid, were removed to the greenhouse. Six of the seven plants produced inflorescences and flowered within a month. These inflorescences were formed in a greenhouse where unaltered December lighting conditions prevailed, demonstrating (as indicated in II-C of Table 1) that this species does not require, subsequent to induction, a long-day regime for flowering. It would seem practicable, therefore, to culture this species by a schedule that would include spring germination, and a fall induction period under a cool temperature regime, with the prevailing light of approximately 40° north latitude. It is probable that these suggestions also apply to *P. sericea* subsp. *sericea* inasmuch as its flowering response is similar. A close relationship is indicated by the genetic compatibility between the two taxa, the F<sub>1</sub> hybrids being highly fertile and also flowering after short-day induction treatments.

In addition to providing knowledge for the successful culture of these and probably other species of alpine perennials, these experiments leave a pointed suggestion for plant geographers, namely, that *Phacelia sericea* subsp. *sericea*, a northern alpine perennial, has, in terms of photoperiod requirements, southerly rather than arctic affinities. This would not be surprising in view of the fact that the great bulk of *Phacelia* species are found south of 40° north latitude, while only two species occur farther north than *P. sericea* subsp. *sericea*.

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#### REVIEWS

*Illustrated Flora of the Pacific States. Washington, Oregon, and California. Volume IV—Bignoniaceae to Compositae.* By ROXANA STINCHFIELD FERRIS. xiii + 732 pages, 1124 figures, and an appendix (for all four volumes) with key to families, index to common names, and index to scientific names. Stanford University Press, Stanford, California. 1960. \$17.50.

In 1923, with the publication of Volume I, Ophioglossaceae to Aristolochiaceae, of the "Illustrated Flora of the Pacific States," Leroy Abrams launched his life's work—an illustrated, descriptive flora of all vascular plants known to grow wild in the three Pacific states—Washington, Oregon, and California. Now, thirty-seven

years later, with the publication on January 22, 1960, of Volume IV, Bignoniaceae to Compositae, by Roxana Stinchfield Ferris, the monumentally conceived project is completed and a milestone in the floristic botany of the western states is achieved. Although the task outlasted the life-time and efforts of Professor Abrams, who died in 1956 after about eight years of failing health, he was very fortunate in having the collaboration and devoted assistance of Mrs. Ferris almost from the beginning of the project, and progress on the flora continued uninterrupted through the years. Mrs. Ferris gave increasing effort to Volume II, Polygonaceae to Krameriaceae, published in 1944, and the task fell upon her of finishing Volume III, Geraniaceae to Scrophulariaceae, published in 1951. She had the entire responsibility for Volume IV. That the finished work ably carries out the objectives stated in Volume I—"to furnish an authentic reference book that will be of greatest service not only to the trained botanist but to everyone interested in the native plant life of the Pacific States."—is tribute not only to Professor Abrams' vision and high level of scholarship but also to Mrs. Ferris' devoted and able efforts toward full realization of his goals.

The "Illustrated Flora of the Pacific States" was designed to duplicate for western botany what Britton and Brown, in their "An Illustrated Flora of the Northern United States, Canada and the British Possessions," had done for eastern botany. These are the only two great North American floristic works in which all species are illustrated and in which the illustrations share along with keys and descriptions the task of species identification. Abrams not only followed the general pattern set by Britton and Brown, but, at first, also followed them in their use of the "American Code" for nomenclature. With the adoption of the International Code after the international congresses of 1930 and 1935, however, the two "codes" were brought almost into accord, and in the 1940 reprinting of Volume I of his flora, Abrams made such generic changes as were necessary to bring his nomenclature into conformity with the International Rules.

In all four volumes specialists were invited to contribute the text for certain plant groups, and in Volume IV Mrs. Ferris had the able assistance of ten such collaborators. In addition she was fortunate in being able to base her treatment of the Compositae as a whole upon extensive manuscript notes from the late Dr. Sidney Fay Blake, who had originally planned to contribute the entire text for this family. Mrs. Ferris wrote the major part of the volume herself, however, and, in many groups such as *Baeria*, *Plantago*, and *Galium*, to name a few, she made significant contributions toward clarification of our understanding of the species.

The illustrations deserve especial consideration inasmuch as they are an integral part of the plan of the entire work. In Volume IV, following the general plan of preceding volumes, the illustration for each species consists of a group of carefully arranged line drawings occupying a rectangle about 2 x 3 inches. There may be two or three or as many as eight separate drawings artistically combined within the given rectangle in such a way as to give both overall aspect or habit of the plant and significant structural details, a combination necessitating much ingenuity and skill. These illustrations of species are then grouped six to a page, or in some cases two or four illustrations may occupy a third or two-thirds of a page. It is stated in the preface that the illustrations, except for the structural features, are half size unless otherwise marked. Legends are confined to binomials, but the pertinent information in the carefully worded text is close at hand, the illustrations and descriptions thus complementing each other and obviating the need for detailed legends. Most of the drawings in Volume IV were made by Jeanne Russell Janish, who was also the artist for many of the illustrations in volumes II and III. Many of the drawings of the Compositae in Volume IV, however, were made by Doris Holm Blake while her husband, Sidney Fay Blake, was working upon what he then hoped would culminate in his full text for the Compositae. The drawings for *Agoseris* and *Helianthus* were made by other artists under supervision of the specialists who contributed the texts for these genera. Except for a few cases where detail is obscured by the illustrations being overly black, reproduction is excellent.

Throughout the volume the keys are skillfully and evenly handled despite the number of different contributors. There are some unfortunate instances of the use of a negative rather than a truly opposing phrase in the second branch of a key dichotomy, but understandably these instances occur particularly in the "difficult" groups. One of the major tasks in preparation of Volume IV was the assembling of an appendix for all four volumes. This contains 1) a key to the families, 2) an index of common names, and 3) an index to scientific names. The family key gives not only the family numbers but also the volume and page on which each family is found, a very necessary aid in a work of this magnitude. The index to common names (there is a common name for every species treated in the four volumes) has the family names printed in small capitals and the genera in Roman type. The index to scientific names is much longer and more complicated than that to common names, having approximately 17,500 entries occupying 79 pages. It has the names of families and tribes printed in small capitals, the genera, species, subspecies, and varieties in Roman type, and the synonyms in italics, all appropriately indented. Because some groups have a great number of species as well as many generic and specific synonyms, the genera in the index to scientific names are not always easy to locate. Possibly greater indentation or perhaps the use of boldface type for generic names would have made them stand out more, although to do this would have necessitated a departure from the style of the previous volumes.

The Stanford University Press has achieved another outstanding accomplishment in typography, printing, and binding, and the volume contains a minimum of typographical and other mechanical errors.

Dr. Bacigalupi, curator of the Jepson Herbarium, has given me permission to quote from the unpublished field notebook of Willis Linn Jepson, whose entry for February 3, 1910, reads: "I am just receiving the first reviews of my Flora of California, Pts. 1 and 2. The critics mostly or even entirely confine themselves to verbal slips, not touching general principles. It is, to be sure, disconcerting enough to have such errors, but after all the main thing is this: 'Has the book got matter in it? Has it got stuff in it? Is it meaty? Not is it *faultless*. A faultless book is impossible. It is inevitable in the nature of the human mind that such slips will be made, mistakes and blunders. But is the job a big one, is it really worthwhile? So satisfied am I in the affirmative that it is a big task, to be done in a big way, without too much considering the danger of possible minor errors, that I go on, to finish up my job, just as other big jobs have been finished aforetime.'"

All will agree that Mrs. Ferris' job has got matter, stuff, and meat in it, that it was a big task, done in a big way.—HELEN K. SHARSMITH, Department of Botany, University of California, Berkeley.

*Experimental Studies on the Nature of Species. IV. Genetic Structure of Ecological Races.* By JENS CLAUSEN and W. M. HIESEY. Carnegie Institution of Washington Publication 615. Washington, D.C. Octavo, vii + 312 pp., 33 figs. 1958. Paper \$4.25, cloth \$4.75.

This is the fourth in the series of scholarly monographs based on the studies of plant evolution conducted by these authors over the past three decades. This newest volume expands the earlier work on the evolutionary importance of ecological races by considering in detail the genetics of the altitudinal races of *Potentilla glandulosa* and then reviewing examples from the literature on the genetic structure of ecological races.

The volume is organized into five chapters and although these are skillfully inter-related they are sufficiently distinct and different to require individual comment. Chapter I, *Ecological Races of P. glandulosa*, introduces the general topic of the volume by presenting what might be called the systematics of *P. glandulosa* as it occurs along the altitudinal transect across central California. This adroitly prepared chapter makes it possible to read the work without reviewing the previous publications by these authors on *P. glandulosa*. Chapter II, *Genetics of Ecological Races*,